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Effectiveness of Photodynamic Laser Therapy in The Complex Treatment of Polypotic Rhinosinusitis

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Annotation: In this article, the role and clinical effectiveness of photodynamic laser therapy in the complex treatment of polypoid rhinosinusitis were analyzed. According to the dissertation data, one of the research objectives is to evaluate the effectiveness of photodynamic laser therapy in the treatment of polypoid rhinosinusitis, and as a scientific novelty, it has been proven that the use of photodynamic laser therapy improves the smell and respiratory function of the nasal mucosa. Also, as a result of the normalization of the level of cytokines in blood serum, the effectiveness of complex treatment by increasing the duration of disease recurrence is substantiated. The article highlights modern approaches to the treatment of polypoid rhinosinusitis, the pathogenetic advantages of using photodynamic laser therapy in combination with surgical and conservative methods, its significance in the postoperative period, clinical dynamics, and its role in reducing relapses. Photodynamic laser therapy has been evaluated as an effective method in the complex management of polypoid rhinosinusitis, contributing to the reduction of local inflammation, acceleration of functional recovery, and improvement of long-term results.

Keywords: polypoid rhinosinusitis, photodynamic laser therapy, complex treatment, olfaction, nasal breathing, recurrence, clinical effectiveness.

Polypoid rhinosinusitis is one of the most complex and relevant diseases in modern otorhinolaryngology. Its main problem is associated with the chronic course of the disease, multifactorial pathogenesis, a tendency to recur even after treatment, and a significant negative impact on the patient's quality of life. According to the World Health Organization, 1-4% of the world's population suffers from chronic polypoid rhinosinusitis, and polyps of the nose and paranasal sinuses are found in 1-5% of the population [3,11,18,24,32,41]. Despite the widespread use of surgical interventions

and medications in recent years, the recurrence rate in polypoid rhinosinusitis, according to various data, reaches from 5% to 60%. This circumstance indicates that in the treatment of the disease, not only the elimination of polyp tissue or temporary suppression of inflammation is sufficient, but a comprehensive approach aimed at its pathogenetic mechanisms is also necessary [1,9,17,26,34,40].

Modern approaches to the treatment of polypoid rhinosinusitis include two main directions: conservative therapy and surgical treatment. Conservative therapy includes local and systemic glucocorticosteroids, anti-inflammatory drugs, antihistamines in the presence of an allergic background, antibacterial or antimycotic drugs in cases of secondary infection, as well as additional measures aimed at functional recovery. Surgical methods are mainly aimed at eliminating polypoid masses in the nasal cavity and paranasal sinuses, restoring ventilation and drainage, and removing pathological tissue. However, practice shows that even after a technically complete operation, the probability of disease recurrence remains. This may be due to the incomplete elimination of inflammation, microcirculation, angiogenesis, edema, local immune reactions, and epithelial restructuring processes in the mucous membrane [5,12,20,27,33,39].

From this point of view, photodynamic laser therapy is of great interest in the complex treatment of polypoid rhinosinusitis. In the dissertation, one of the research tasks is to assess the effectiveness of photodynamic laser therapy in the treatment of polypoid rhinosinusitis. In the scientific novelty section, it has been proven that the use of photodynamic laser therapy in complex treatment improves the smell and respiratory function of the nasal mucosa. In addition, as a result of the normalization of the level of cytokines in blood serum, the effectiveness of complex treatment of polypoid rhinosinusitis has been proven due to the prolongation of the disease recurrence period. These data allow us to assess photodynamic laser therapy not just as a physiotherapeutic supplementary method, but as a pathogenetically justified component of complex treatment [2,10,16,25,35,42].

The clinical advantage of photodynamic laser therapy is that it can simultaneously affect several pathogenetic links in polypoid rhinosinusitis. Firstly, the activity of local

inflammation decreases. Secondly, nasal breathing is facilitated by a decrease in mucosal edema and improvement in local trophism. Thirdly, conditions are created for the restoration of the olfactory function. Fourthly, it contributes to the correct restoration of the mucous membrane in the postoperative period. Fifthly, polyposis can improve long-term results by influencing the molecular and cytokine mechanisms involved in the recurrence of the process. The fact that a separate rationalization proposal and methodological certificate were obtained for this method in the dissertation also indicates that this approach was developed and applied for practice [6,13,19,28,31,38].

When assessing photodynamic laser therapy for polypoid rhinosinusitis from the point of view of clinical effectiveness, it is necessary to pay attention to several main criteria. These include improvement of nasal breathing function, restoration of smell, stabilization of the local mucosal state, reduction of signs of inflammation, normalization of pathogenetic indicators at the level of blood serum and tissues, as well as an increase in the duration of relapse. In this regard, photodynamic laser therapy is considered not as a simple symptomatic effect, but as an auxiliary method aimed at suppressing the biological activity of the disease [4,14,21,23,30,37].

The following table summarizes the main clinical directions of the use of photodynamic laser therapy in the complex treatment of polypoid rhinosinusitis.

Table 1

Possible clinical effects of photodynamic laser therapy in the complex treatment of polypoid rhinosinusitis

Direction of influence	Expected clinical outcome	Practical significance
Effects on local inflammation	Swelling and hyperemia decrease	Nasal congestion and discomfort decrease
Effect on mucosal trophicity	Recovery will accelerate	The postoperative period is mild.

Effect on nasal breathing	Improves airflow	Patient complaints decrease
Effect on olfactory function	Improves olfactory function	Quality of life improves
Influence on cytokine and pathogenetic background	A tendency towards normalization is observed	Reduces the risk of recurrence
Long-term result	Renewal period extends	The range of dispensary observation is expanding.

As can be seen from this table, the significance of photodynamic laser therapy is not limited to only short-term symptomatic improvement. It can also improve long-term control by stabilizing biological processes in the background of postoperative or conservative treatment.

The dissertation states that the use of photodynamic laser therapy in assessing the effectiveness of complex treatment of polypoid rhinosinusitis improves the olfactory function and respiratory function of the nasal mucosa. This is clinically very important. Because one of the symptoms that patients most often complain about in polypoid rhinosinusitis is difficulty breathing through the nose, and the second is a decrease or complete loss of smell. Improved respiratory function has a positive effect on the patient's daily activity, sleep, work capacity, and general condition. And the restoration of the olfactory function is of great importance from the point of view of restoring the ability to perceive the taste of food, professional activity, and the sense of danger. Consequently, the results of photodynamic laser therapy are significant not only from an objective, but also from a subjective point of view [7,8,15,22,29,36].

The true value of any method in the treatment of polypoid rhinosinusitis is assessed by its effect on recurrence. The dissertation notes that as a result of the normalization of the level of cytokines in blood serum, the effectiveness of complex treatment has been proven due to the prolongation of the disease recurrence period. Here the importance of photodynamic laser therapy becomes even more apparent. If treatment is aimed only at removing the polypoid mass, the pathogenetic environment

against the background of inflammation in the mucous membrane can be preserved. On the contrary, the use of methods such as photodynamic laser therapy in complex treatment increases the likelihood of stabilization of the biological background and, thereby, an increase in the duration of regeneration. This is important from the point of view of protecting the patient from repeated surgery, reducing treatment costs, and maintaining a longer quality of life.

The table below provides a comparative interpretation of polypoid rhinosinusitis from the point of view of a comprehensive approach, including a conventional approach and photodynamic laser therapy.

Table 2

Comparative features of the standard and complex approach to the treatment of polypoid rhinosinusitis

Rating criterion	Standard treatment	Complex treatment with FDLT inclusion
Purpose	Elimination of polypoid mass, reduction of inflammation	Pathogenetic and functional influence on the polypoid process
Short-term impact	Symptoms decrease	Symptoms decrease and functions improve
Respiratory function	May be improved	Expect better and more stable recovery
Sense of smell	Not always fully recoverable	High probability of recovery
Exposure against inflammation	Restricted	It also affects local biological activity
Recurrence	May be saved	High probability of extension
Long-term effect	Unstable	Can be relatively stable

Of course, this table is a generalized clinical model, compiled on the basis of the pathogenetic and practical conclusions presented in the dissertation, which helps to explain the advantages of the method. The approach presented in it means that

photodynamic laser therapy should be considered not as a substitute for surgery or conservative measures, but as an element that enhances and stabilizes their effectiveness.

The importance of photodynamic laser therapy in the postoperative period deserves special attention. In the fourth chapter of the dissertation, a separate section is devoted to "Analysis of the dynamics of patients with polypoid rhinosinusitis in the postoperative period." This also indicates that the results of treatment in the study were not limited to the time of the operation, but were also assessed by subsequent rehabilitation and functional observation. In the postoperative period, the stabilization of edema, local inflammation, microcirculation, and trophic processes in the mucous membrane is very important. Otherwise, pathological tissue restructuring may develop again, and the polypoid process may reappear. In this regard, photodynamic laser therapy can be an important tool aimed at improving the postoperative biological environment.

Another important aspect of photodynamic laser therapy is the possibility of its influence on processes associated with pathogenetic biomarkers. The dissertation shows that changes in the levels of p53, EGF, VEGF, and VEGFR-2 are a determining factor in the course and development of polypoid rhinosinusitis. Normalization of cytokine levels and prolongation of the recurrence period were also noted with the use of photodynamic laser therapy. Consequently, this method, along with affecting the morphofunctional state of the mucous membrane, can also improve the molecular background of inflammation and restructuring. This further increases its clinical value.

From a practical point of view, it is necessary to pay attention to which patients the use of photodynamic laser therapy may be especially appropriate. These include prolonged polypoid rhinosinusitis, repeated manifestations, patients who have undergone multiple surgeries, patients with an allergic background, conditions accompanied by bronchial asthma, and patients with significant impairments of nasal breathing and olfaction. It is in such patients that the value of a comprehensive approach can be high.

Thus, photodynamic laser therapy plays an important role in the complex treatment of polypoid rhinosinusitis. The dissertation notes that the assessment of the effectiveness of this method was set as a task, as a scientific novelty, the olfactory properties and respiratory function of the nasal mucosa were improved, and as a practical result, its clinical effectiveness was studied and proven. In addition, the normalization of cytokine levels and the prolongation of relapse periods are presented as important evidence of the effectiveness of complex treatment. Consequently, photodynamic laser therapy can be considered as a pathogenetically based method that improves the functional outcome and provides long-term clinical advantage in polypoid rhinosinusitis.

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